

AIRCRAFT TUG HITCH ASSEMBLY

Related Application

This application claims the benefit under 35 USC 121 of United States Provisional Application No. 60/397,243 filed on July 22, 2002 in the name of Thomas M. Williams, Jr. and entitled "Aircraft Tug Hitch Assembly".

Field of the Invention

The present invention relates to coupling systems for releasably attaching a tow bar to an aircraft tug for transferring an aircraft between field locations.

Background of the Invention

Aircraft tractors or tugs are used in combination with a tow bar attached to the nose wheel of an aircraft for transporting the aircraft on the ground, such as ramp and taxi positions. The tug typically has a hitch at the rear having upper and lower apertured plates. The tow bar frontally terminates with an apertured tow eyelet. For connecting, the tug operator maneuvers the hitch into proximity with the tow bar, while the eyelet is aligned with the hitch by an assistant on the ground. Inasmuch as the tug structure prevents direct visual observation, the tug operator is reliant on the assistant for movement instructions. When properly aligned the assistant inserts a latch pin through the plates and the eyelet to complete the coupling. The operation requires accurate and timely communication between the parties to accomplish a time efficient and safe connection. These requirements are often compromised by operating conditions resulting in a large incidence of personnel injuries.

Brief Summary of the Invention

The present invention provides hitch assembly for coupling an aircraft tow bar with an aircraft tug having a hitch at the rear including vertically spaced upper and lower plates having coaxially aligned apertures with which an apertured eyelet is aligned for coupling. The hitch assembly includes: a locking assembly fixedly connected to said upper plate having a sliding locking bolt that is moveable between a lowered locked position extending through said plates and the eyelet, and a raised unlocked position. A lift handle raises the locking bolt between the lower and raised position including a detent notch for releasably maintaining said unlocked position. A pair of spring biased laterally spaced inwardly converging guide plates carried between the hitch plate provides a receiving pocket for aligning the tow bar eyelet with the lock pin. The guide plates resiliently deflect to permit tight radius turns. A signal rod on the locking bolt carries an indicator ball at top. The ball is visible to the tug operator to indicate the unlocked position, but is not visible in the locked position to thereby indicate coupled locked status between the aircraft and the tug.

Accordingly, it is an object of the invention to provide a hitch assembly for coupling an aircraft tug with an aircraft tow bar wherein coupling can be readily and safely accomplished.

Another object is to provide an aircraft hitch wherein the aircraft tug operator can visually determine the status of the hitch coupling.

A further object is to provide an aircraft tug hitch assembly wherein deflectable guide surfaces properly orient a tow bar eyelet for coupling.

Yet another object is to provide a locking aircraft towing hitch that may be aligned and locked by a single operator with reduced interaction with the aircraft tug operator.

Description of the Drawings

The above and other features of the present invention will become apparent upon reading the following written description taken in conjunction with the accompanying drawings in which:

Figure 1 is a rear perspective view of an aircraft tug provided with the tug hitch assembly in the unlocked position prior to coupling with an aircraft tow bar;

Figure 2 is a rear perspective view of the aircraft tug with the tug hitch assembly coupled in the locked position with the aircraft tow bar;

Figure 3 is a side elevational view of the tug hitch assembly in the locked position with the aircraft tow bar;

Figure 4 is a view showing the tow arm aligned at the hitch assembly in the locked position;

Figure 5 is another view showing the hitch assembly in locked position with the tow bar; and

Figure 6 is a top view of the tug hitch assembly;

Figure 7 is a top view of the guide assembly of the tug hitch assembly taken along line 7-7 in Figure 5; and

Figure 8 is a fragmentary view taken along line 8-8 in Figure 3 showing the lock assembly in the locked position.

Description of the Invention

Referring to Figures 1 and 2 for the purpose of describing a preferred embodiment of the present invention and not for limiting same, a self-aligning tug hitch assembly 10 is provided for coupling an aircraft tow bar 12 including a hitch eyelet 13 to the hitch 14 at the rear of an aircraft tractor or tug 16. In Figure 1, the tug hitch assembly 10 is in the unlocked position with the tow bar 12 proximate thereto. The tug hitch assembly 10 carries a

vertical indicating pole 18 having an indicator ball 19 at the top thereof. In the unlocked position, the indicator ball 19 is above the rear end of the tug 16 providing visual indication of the unlocked status. In Figure 2, the tow bar 12 is coupled to the tug hitch assembly 10 in a locked position and the indicator ball 19 is below the rear of the tug and not visible to the operator thereby indicating the locked status.

Referring additionally to Figure 3, the hitch 14 is of a type conventionally incorporated on commercial aircraft tugs. The hitch 14 comprises a pair of triangular, vertically spaced upper and lower plates 20, 21 defining therebetween a rearwardly opening horizontal slot for receiving the tow bar eyelet. As shown in Figures 4 through 6, the plates 20, 21 are attached at their base ends to the tug 16. The plates 20, 21 have vertical coaxially aligned holes 22 at the forward end. In conventional use, a lock pin is inserted through the holes 22 for coupling the tow bar. The tow bar 12 is a conventional. In a coupling position as shown in Figure 4, the opening in the eyelet 13 registers with the holes 22 in the plates 20, 21.

The hitch assembly 10 includes a lock assembly 40 and a guide assembly 42. The lock assembly 40 is fixedly connected above the upper plate 20 of the hitch 14. The guide assembly 42 is fixedly connected in the horizontal slot between the upper and lower plates 20, 21 of the hitch 14.

The lock assembly 40 includes a mounting plate 44, a lock cylinder 46, a lifting handle 48 and a release handle 49. The mounting plate 44 and the guide assembly 42 are attached to the top surface of the upper plate 21 by pair of fasteners 50 in two longitudinally spaced transverse rows 52, 54. The layout of the fastener holes conforms with existing hole patterns on many existing tugs.

The lock cylinder 46 is welded at a lower end to the top surface of the mounting plate 44 coaxial with the holes 22 in the hitch plates 20, 21 and a complementary hole in the mounting plate 44.

Referring to Figures 4 and 5, a lock pin assembly 60 is slidably carried by the lock cylinder 46. The lock pin assembly 60 includes a cylindrical piston 62 coaxially carrying at the lower end a downwardly depending lock pin 64. A latch rod 66 is transversely connected to the piston 62. As additionally shown in Figure 8, the latch rod 66 extends outwardly through an upwardly opening vertical guide slot 68 formed in the rearward side of the cylinder 46. A circumferential notch 69 is formed adjacent the slot 68 and provides a stop surface for the latch rod 66 in the unlocked position as described in greater detail below.

As shown in Figures 1 and 5, in a raised unlocked position, the piston 62 withdraws the lock pin 64 from the hitch slot. Thereafter the handle 49 is rotated to rotate the piston 62 to locate the latch pin 66 at the notch 69 to establish a detented locked position. In the locked position as shown in Figures 2 and 4, the handle 49 and piston 62 are rotated to align the latch rod 66 with the guide slot 68 allowing the piston to fall until the piston 62 engages the mounting plate 44 and the lock pin 64 slides into the openings 22 in the hitch plate 20, 21 thereby coupling the eyelet 30 of the tow bar 12 enabling towing of the aircraft by the tug 16. If desired, a spring assist may be employed for biasing the piston after release.

Referring to Figures 3, 6 and 8, the lift handle 48 extends transversely to the mounting plate 44 rearward of the lock cylinder 46. The inner end of the handle 48 is received between a pair of spaced transverse guide plates 70 attached to the mounting plate 44. The lift handle 48 includes a horizontal leg 72 inwardly terminating with an upwardly inclined arm 74. The outer

end of the arm 74 is connected at the upper and outer ends of the guide plates 70 by fastener 76 for pivotal movement about a longitudinal horizontal axis 78. In the locked position the latch rod 66 is slightly above the arm 74 of the lift handle 48. As an operator raises the leg 72 upwardly, the arm 74 engages the latch rod 66, shifting the later and the latch pin assembly 60 upwardly in the guide slot 68. The indicator pole 18 is carried at the top of the piston 62. In the unlocked position, the ball 19 is above the top of the tug chassis and the ball is clearly visible by the tug operator 48 to denote an unlocked condition. In the locked condition, the ball 19 is below the chassis and not observable by the tug operator. Accordingly, the tug operator by virtue of the ball location can determine the locking status of the tug hitch.

Referring to Figures 3 and 7, the guide assembly 32 comprises a pair of laterally spaced, spring biased locating plate assemblies 70 pivotally attached at inner ends to the hitch 14. The locating plate assemblies 70 are generally wedge shaped having triangular top and bottom plates, forwardly and inwardly converging front plates 72 and transverse rear plates 74. The front plates 72 are normal to the vertical axis of the hitch opening 22 and defining a rearwardly opening triangular pocket of sufficient size for receiving and aligning the tow bar eyelet 13 with the locking pin 64 as the tug operator advances toward the tow bar. Preferably, the front plates 72 have an included angle of around 60° to 120° . Spring assemblies 76 bias the plate assemblies 70 to the illustrated normal position for receiving the tow bar eyelet. Each spring assembly 76 includes a compression spring 78 surrounding a threaded rod 80 having a hook end 82 captured by the shank of a fastener 50. The front end of the rod 80 and a shaft 82 that extends through an aperture in the rear plate 74 and has a nut and washer assembly

84 adjustably connected thereto for establishing the inclination of the front plates 72 and preloading of the spring 78. Access to the assemblies 84 is provided through apertures 86 in the top plate. As is apparent, in addition to guiding the tow bar into alignment for coupling, the plate assemblies 70 will absorb impacts during alignment. Further, each plate assembly 70 may pivot about the associated fastener 50 sufficiently to accommodate a tow bar orientation transverse to the tug 16, thereby allowing tight radius turns in the towing of the aircraft.

In operation, a ground assistant aligns the tow bar 12 with the pocket of the guide assembly 42 as shown in Figures 1. The tug operator has seen the ball 19 to verify the unlocked condition. When the eyelet 13 is accurately aligned, the assistant rotates the release handle 49 to align with the slot 68 and the piston 62 and lock pin 64 to drop to the locked position shown in Figure 4, thereby coupling the tow bar, whereat the ball 19 is no longer visible by the tug operator thus confirming the connection.

Unlatching is effected by raising the lifting lever 48, as shown in Figure 5, to raise the lock pin to the unlocked raised position. Thereafter, the release handle 49 is rotated to locate the latch rod 66 in the notch to establish the unlocked condition.

Having thus described a presently preferred embodiment of the present invention, it will now be appreciated that the objects of the invention have been fully achieved, and it will be understood by those skilled in the art that many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the present invention. The disclosures and description herein are intended to be illustrative and are not in any sense limiting of the invention, which is defined solely in accordance with the following claims.

